

Final
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia



Prepared for
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Contract No. N62470-02-D-3052
CTO-0057

December 2006

Prepared by
CH2MHILL

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Acronyms and Abbreviations

AOC	Area of Concern
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COPC	constituent of potential concern
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ft	foot/feet
IAS	Initial Assessment Study
IRP	Installation Restoration Program
JV I	Agviq-CH2M HILL Joint Venture I
mg/kg	milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Navy Energy and Environmental Support Activity
NFA	no further action
NPL	National Priorities List
NTCRA	non-time-critical removal action
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RAB	Restoration Advisory Board
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RRR	Relative Risk Ranking
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Investigation
SJCA	St. Juliens Creek Annex
SMP	Site Management Plan
SSA	Site Screening Assessment
SSI	Supplemental Site Investigation
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List

µg/l	microgram per liter
µg/kg	microgram per kilogram
UTL	upper tolerance limit
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

SECTION 1

Declaration

1.1 Site Name and Location

Site 19, Former Building 190
St. Juliens Creek Annex (SJCA)
Chesapeake, Virginia

1.2 Statement of Basis and Purpose

This Closeout Report presents the determination that no further action (NFA) is necessary to ensure protection of human health and the environment at Site 19 at SJCA. This determination has been made in accordance with Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record for the site. The Navy, United States Environmental Protection Agency (EPA) Region III, and Virginia Department of Environmental Quality (VDEQ) concur with the NFA determination.


1.3 Description of Selected Remedy

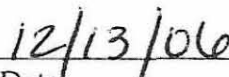
During site investigation activities, potentially unacceptable human health risk was identified based on exposure to soil contamination at the site; unacceptable risk was not identified for exposure to any other media, nor was any unacceptable risk to ecological receptors identified. A removal action was conducted at Site 19 in May 2006, which eliminated the potentially unacceptable risk associated with potential exposure to soil contamination at the site. Therefore, no further action is necessary for the site to ensure protectiveness for human health and the environment. In the event that new information becomes available after site closeout that suggests the potential for contamination to be present that poses an unacceptable risk to human health or the environment after site closeout, the Navy will reevaluate site conditions and undertake necessary actions to ensure continued protection of human health and the environment.

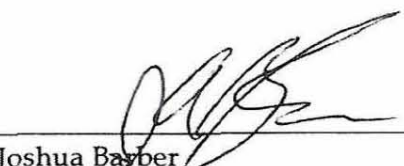
1.4 Statutory Determination

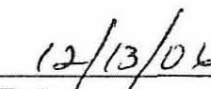
The removal action conducted at Site 19 has eliminated the need to conduct any remedial action. As there are no hazardous substances, pollutants, or contaminants remaining onsite above levels that prevent unlimited use and unrestricted exposure, a five-year review is not required.


1.5 Authorizing Signatures

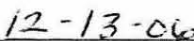

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Decision Summary

2.1 Site Name, Location, Description, and Characteristics

SJCA is a 490-acre facility situated at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake, in southeastern Virginia (Figure 2-1). SJCA began operations as a naval ammunition facility in 1849 and was one of the largest ammunition depots in the United States involving wartime transfer of ammunitions to various other naval facilities. In 1975, all ordnance operations were transferred to Yorktown Naval Weapons Station. In 1977, decontamination was performed in, around, and under ordnance-handling facilities at SJCA. The current primary mission of SJCA is to provide a radar-testing range and administrative and warehousing facilities for local naval activities. SJCA was placed on the National Priorities List (NPL) in August 2000 (EPA ID: VA5170000181).

Site 19 encompasses 3.2 acres just south of the confluence of Blows Creek with the Southern Branch of the Elizabeth River (Figure 2-2). Site 19 comprises the area of former Building 190 and the surrounding access roads and adjacent grass field. Building 190 was used for loading explosives into ammunition. The ammunition was loaded into railroad cars for transport off site. From the 1940s to the 1970s, Explosive D and Composition A-3 were reportedly used. In 1977, during the ordnance decontamination, all ordnance-handling buildings were decontaminated by flushing with chemical solutions and water. Prior to and at the conclusion of the decontamination process, visual inspections and tests for RDX and Explosive D were performed at Building 190 to certify that it was decontaminated. However, since the level of decontamination was not specified, a potential for ordnance residue remained.

Building 190 was demolished sometime after 2000 and the site is now a grass-covered field. The site is relatively flat with topography less than 6 ft above mean sea level with abrupt slopes to the adjacent surface water bodies. The topography is relatively flat and raised, which is inconsistent with the gently sloping surrounding topography, indicating the site was likely filled with dredge material. Two concrete drainage culverts lead underground from former Building 190 to the Southern Branch of the Elizabeth River (Figure 2-3). There are no other man-made surface and subsurface features (e.g., tanks, structures) or areas of archaeological or historical importance at Site 19.

2.2 Site History and Enforcement Activities

The following subsections provide summaries of the previous investigations conducted at Site 19.

Initial Assessment Study (NEESA, April 1981)

An Initial Assessment Study (IAS) was conducted at SJCA to qualitatively identify and assess sites that posed a potential threat to human health or the environment as a result of contamination from past handling of (and operations involving) hazardous material. The study included an on-site survey of the facility, review of activity records and maps, and interviews with long-time employees and retirees of SJCA. The IAS identified Building 190 as a building in which loose ordnance materials were handled. Trichloroethylene was reportedly used in the building for degreasing ordnance hardware, but was disposed of at the burning grounds (Site 5). Waste hydraulic fluid from hydraulic pump and equipment maintenance at Building 190 and several other buildings was reportedly disposed of along the fence line for weed control and on the roads for dust control at the facility.

The IAS determined that SJCA did not pose a threat to human health and the environment and no confirmation study was recommended. Based on the previous handling of loose ordnance, the IAS recommended that if Building 190 was planned for human occupancy, the Navy Environmental Health Center determine whether the building was fit for human occupancy.

Phase II RCRA Facility Assessment (A.T. Kearney, Inc. and K.W. Brown & Associates, Inc., March 1989)

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was completed to identify Solid Waste Management Units (SWMUs) and other Areas of Concern (AOCs) at SJCA and to evaluate their potential for releases of hazardous wastes or constituents to the environment. The RFA included preliminary review of all available relevant documents and a visual site inspection of 34 SWMUs and AOCs. In the vicinity of Site 19 two AOCs were identified: AOC H as Residual Ordnance at Buildings M-5 and 190, and AOC J as Former Ammunition Manufacturing Areas.

AOC H was identified as the area between Buildings M-5 and 190 that consisted of various undefined construction rubble. It was believed that various ordnance items that were disposed of in this area during past ordnance management operations may still be present in the soils. Facility representatives stated that they had no knowledge of residual contamination in this area and a visual inspection was not performed. The RFA recommended the collection of soil samples between the two buildings and identification of the type, amount, and extent of ordnance present. If residual ordnance was identified, remedial cleanup was recommended.

AOC J was identified as Former Ammunition Manufacturing Areas, including Building 190. The RFA recommended a waste assessment in this area to determine if hazardous constituents were released from the buildings and to identify the type and amount of waste generated and the operational and waste management practices. If the potential for releases of hazardous wastes or hazardous constituents from any former ammunition manufacturing areas was identified, the RFA recommended verification or characterization sampling.

Relative Risk Ranking Data Collection (CH2M HILL, April 1996)

The Navy's Relative Risk Ranking (RRR) System was used to determine which sites required further investigation and to prioritize those sites where further investigative work

was needed based on the level of relative risk. Based on the information provided in the IAS and RFA, the Navy identified 21 sites to be addressed by the RRR System. AOC H was identified in the RRR as Site 19. Two surface soil samples (SJC19SS01 and SJC19SS02) were collected from the area between Building 190 and Building M-5 and one groundwater sample (SJS19-GW01) was collected downgradient from the area (Figure 2-3). The surface soil samples were collected from 0 to 1-foot (ft) below ground surface (bgs) and the groundwater sample was collected from the water table (Columbia Aquifer). The samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides/polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals and cyanide, and nitramines (a subset of explosives).

Several pesticides/PCBs, polycyclic aromatic hydrocarbons (PAHs) (a subset of SVOCs), and metals were detected in surface soil. Two VOCs (acetone and methylene chloride) and several metals were detected in groundwater. No nitramines were detected in surface soil or groundwater. As these data were used for screening purposes only; background or quality control samples were not collected and the data were not validated.

The potential human receptors identified at Site 19 were groundskeepers and adjacent building occupants. The potential ecological habitat identified was the tidal marsh east of the site. Potential migration pathways comprised surface soil and groundwater for human receptors and adjacent surface water and sediment to human and ecological receptors.

Site Screening Assessment (CH2M HILL, April 2002)

A Site Screening Assessment (SSA) was conducted to evaluate 20 sites at SJCA, including Site 19, to determine if each site required additional investigation, removal action, or NFA. As part of the SSA, the unvalidated analytical results from soil and groundwater samples collected during the RRR were used to conduct human health and ecological risk screenings. The SSA concluded that potential human health risks from metals in soil and arsenic and methylene chloride in groundwater should be further evaluated. No further evaluation of potential ecological effects was recommended based on the minimal habitat and transport pathways identified. Based on a July 2001 site visit by the SJCA partnering team (consisting of representatives from the Navy, EPA, and VDEQ), concerns were raised for potential impacts associated with the drainage culverts discharging from the site and consensus for further investigation was reached.

Site Investigation (CH2M HILL, June 2004)

Based on the conclusions of the SSA, additional evaluation of Site 19 was conducted as part of a Site Investigation (SI). The SI activities included an evaluation of historical information to determine whether SJCA activities were a source of contamination to site media, identification of data gaps and collection of analytical samples, and human health and ecological risk screenings to assess whether a Remedial Investigation or NFA was warranted for the site.

Based on the evaluation of historical information and interviews conducted with former employees in December 2001, the site boundary was expanded to encompass the former Building 190 footprint (Figure 2-3). Ten co-located surface and subsurface soil samples were collected for a total of 20 soil samples, to address data gaps from the previous

investigations. Two sediment samples were collected immediately downstream of the two drainage culverts that discharge to the Southern Branch of the Elizabeth River. The samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals and cyanide, and explosives.

Potential human health risks from PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene) in surface and subsurface soil, and cadmium and chromium in surface soil were identified. The SI recommended further delineation of PAHs in surface soil in the former Parking Lot Area (SJS19-SS03), subsurface soil in the Elevated Subsurface Soil PAHs Area, and metals in surface soil adjacent to the Metallic Slag Area (SJS19-SS11) to determine the potential impact to site soils. These areas are shown in Figure 2-3. Groundwater sampling was also recommended in the Elevated Subsurface PAHs Area to assess the potential impact of the elevated PAHs found in subsurface soil (SJS19-SB12). Although the SSA (CH2M HILL, April 2002) concluded that groundwater should be further evaluated to confirm the presence of arsenic and methylene chloride posing potential human health risks, no further evaluation of groundwater in the Metallic Slag Area was deemed warranted based on the sample collection method (geoprobe), the unvalidated laboratory results, the frequent occurrence of methylene chloride as a common laboratory contaminant, and no indication of elevated arsenic or methylene chloride in the site soil.

Although Site 19 provides minimal habitat for potential ecological receptors, the two concrete drainage culverts have the potential to transport chemicals into the marsh habitat bordering the Southern Branch of the Elizabeth River adjacent to Site 19 where a variety of aquatic and aquatic-based wildlife species could be exposed to chemicals. Potential ecological risks to benthic-dwelling organisms from PAHs, DDT, DDE, and metals in sediment and potential risk to aquatic-based wildlife from metals in sediment were identified based on the results of the two sediment samples. However, it is unclear if these chemicals originated from Site 19 or if they are indicative of non site-related constituents found in the Southern Branch of the Elizabeth River. The constituents found in Site 19 sediment are frequently detected in urban water bodies such as the Elizabeth River and although these constituents may be in part related to historic site activities, the presence of these chemicals more likely reflects chemical input from a variety of anthropogenic sources; therefore, no further evaluation of sediment was recommended.

Supplemental Site Investigation (CH2M HILL, September 2005)

A Supplemental SI (SSI) was completed to determine if PAHs detected in a surface soil sample collected from the Parking Lot Area are related to the site processes that occurred at Building 190; to delineate the horizontal and vertical extent of PAHs detected in subsurface soil for potential removal and to assess the potential impact to shallow (Columbia Aquifer) groundwater; and to delineate the horizontal and vertical extent of the Metallic Slag Area for potential removal.

The results and conclusions are organized by the specific area investigated; the Parking Lot Area, Metallic Slag Area, and Elevated Subsurface Soil PAHs Area (Figure 2-3):

- **Parking Lot Area** - In order to determine if the PAHs detected in surface soil sample SJS19-SS03 during the SI were related to site activities or vehicular use, two surface soil

samples were collected from the Parking Lot Area and two surface soil samples were collected from outside the Parking Lot Area during the SSI (**Figure 2-3**). None of the samples had PAH concentrations that exceeded both the EPA Region III risk-based concentrations (RBCs) for residential soil (EPA, April 2005) and SJCA background upper tolerance limit (UTL) for dredge fill soil (CH2M HILL, October 2001).

The SJCA partnering team reached consensus in March 2005 that the PAHs detected in surface soil sample SJS19-SS03 were related to vehicular use and not site-related based on historical use of the area as a parking lot.

- **Metallic Slag Area** – During the SI, surface soil sample SJS19-SS11 was collected from an area where metallic slag was identified on the ground surface. Because the sample had several exceedances of both the residential RBCs and background UTLs, a removal action was warranted. In order to delineate the horizontal and vertical extent of the Metallic Slag Area, four surface soil samples and one subsurface soil sample were collected during the SSI (**Figure 2-4**). The surface soil samples were collected around the perimeter of the visible metallic slag and the subsurface soil sample was collected from beneath the visible extent of metallic slag to serve as confirmation samples of residual soil concentrations following a removal action.

With the exception of one surface soil sample (SJS19-SS18) located adjacent to the roadway, the metals concentrations of the samples collected during the SSI did not exceed both the residential RBCs and background UTLs and were lower than or similar to those detected in the initial sample SJS19-SS11; therefore, these concentrations (excluding SJS19-SS18) represented soil that could be left in place. Therefore, it was recommended the Metallic Slag Area be removed to the horizontal extent of the surface soil sample locations collected during the SSI, with the exception of SJS19-SS18, where the removal should extend to the adjacent roadway. The vertical extent of removal was recommended to be 1.5 ft bgs, the depth of the subsurface soil sample collected during the SSI (SJS19-SB13), or to the visual limits of the metallic slag (**Figure 2-4**).

- **Elevated Subsurface Soil PAHs Area** – During the SI, several PAHs were detected in subsurface soil sample SJS19-SB12 above both the residential RBCs and background UTLs, suggesting a removal action was warranted. In order to delineate the horizontal and vertical extent of the PAHs for potential removal, four subsurface soil samples were collected during the SSI. The subsurface soil samples were collected around the perimeter of and from a depth beneath SJS19-SB12 to serve as confirmation samples of residual soil concentrations following a removal action.

One PAH (benzo(a)anthracene) was detected at one location (SJS19-SB16) during the SSI at a concentration above both the residential RBC and background UTL. However, the concentration of benzo(a)anthracene (2,200 µg/kg) was only slightly higher than the background UTL (2,027 µg/kg) and was below the maximum concentration (4,400 µg/kg) detected in subsurface soil during the background investigation, and is therefore likely indicative of dredge fill (**Figure 2-5**). Based on these results, it was recommended that the soil from which the SSI samples were collected remain in place and serve as the limits for the removal area of the elevated PAHs in subsurface soil to the north, south, and west of SJS19-SB12, and the adjacent roadway serve as the limits to the east. The

vertical extent of removal was recommended to be 4 ft bgs, the depth of SSI sample SJS19-SB15 (**Figure 2-5**).

Additionally, one groundwater sample was collected during the SSI to assess the potential impact of elevated PAHs to shallow groundwater; no PAHs were detected.

The SJCA partnering team reached consensus in June 2005 to use the SSI samples collected from the Metallic Slag Area and Elevated Subsurface PAHs Area at Site 19 as confirmation samples for a removal action to mitigate potential human health risk; therefore, no additional sampling was necessary following the removal action. After completion of the removal action, the team agreed to move forward with an NFA closeout report for Site 19.

Engineering Evaluation/Cost Analysis (CH2M HILL, November 2005)

Based on the findings of the SSI, an Engineering Evaluation/Cost Analysis (EE/CA) was conducted to evaluate removal action alternatives to mitigate potential human health risk at Site 19. Three alternatives (no action, excavation of impacted soils and backfill with import material, and construction of soil covers over the Metallic Slag Area and Elevated Subsurface Soil PAHs Area) were identified, evaluated, and ranked. Based on a comparative analysis of the alternatives, the selected non-time-critical removal action (NTCRA) was excavation of impacted soils and backfill with import material.

Removal Action (Agviq-CH2M HILL Joint Venture I [JV I], March 2006 and July 2006)

The NTCRA activities at Site 19 were completed in May 2006 in accordance with the EE/CA (CH2M HILL, November 2005) and Removal Action Work Plan (JV I, March 2006). Approximately 500 tons of soil were removed, transported, and disposed from the excavation areas. The limits of excavation were delineated based on pre-removal confirmatory sampling during the SSI. The excavation areas were backfilled with topsoil and general fill with concentrations below VDEQ standards for total petroleum hydrocarbons and below residential RBCs for VOCs, SVOCs, pesticides/PCBs, and metals. The Construction Closeout Report (JV I, July 2006) summarizes the NTCRA activities.

Enforcement Activities

No enforcement activities have been initiated at Site 19.

2.3 Community Participation

Community participation at SJCA includes a Restoration Advisory Board (RAB), public meetings, public information repository, fact sheets, public notices, and an Installation Restoration Program (IRP) web site (<http://public.lantops-ir.org/sites/public/sjca/>). The Community Involvement Plan for SJCA provides detailed information on community participation for the IRP.

The RAB was formed in 1999 and consists of community members and representatives of the Navy, VDEQ, and EPA. RAB meetings are held every May and October and are open to the public to provide opportunity for comment and input on the IRP. Previous investigations, the removal action activities, and proposed no further action determination for Site 19 were discussed at previous RAB meetings. The documents prepared as part of the

IRP are maintained in the Administrative Record and listed at an information repository (Major Hillard Library, Chesapeake, Virginia) for review by the public. The Administrative Record, information repository, and IRP web sites are updated on a regular basis.

For access to the Administrative Record or additional information on the IRP, contact:

Public Affairs Officer
Commander, Navy Region Mid-Atlantic
1510 Gilbert Street
Norfolk, VA 23511
(757) 322-2853

Community involvement requirements for NTCRA include preparing an EE/CA and making it available for public review and comment for a period of 30 days. A public notice for public comment on the Site 19 EE/CA was published in *The Virginian Pilot* newspaper on October 16, 2005. The EE/CA was made available for public review at the Major Hillard Library in Chesapeake, Virginia from October 17, 2005 until November 16, 2005. No comments were received.

2.4 Scope and Role of Response Actions

Site 19 is one of several IRP sites being addressed under CERCLA at SJCA. The Federal Facilities Agreement for SJCA documents how the Navy intends to meet and implement CERCLA in partnership with EPA and VDEQ (Department of Defense, March 2004). The Site Management Plan (SMP) contains the location, description, contaminants of concern, and cleanup status of each IRP site. The SMP is updated annually and is available in the Administrative Record.

2.5 Current and Potential Future Site and Resource Uses

Site 19 is located in an industrial area of the facility and is currently not being used. No changes in this land use are planned. Future residential use at Site 19 is unlikely; however, the residential scenario was evaluated during the SI as the most conservative human exposure scenario. Groundwater at the site is not currently used and is unlikely to be used in the future, as the City of Chesapeake supplies water to SJCA and surrounding communities. Because Site 19 is located at the confluence of Blows Creek and the Southern Branch of the Elizabeth River, any current or future use of surrounding groundwater would be hydraulically upgradient from the site.

2.6 Site Risks

A detailed discussion of risk estimated at Site 19 prior to the NTCRA can be found in the SI (CH2M HILL, June 2004). In summary, prior to the NTCRA at the site, potential human health risks were associated with exposure to PAHs and metals in soil. No risks were identified from exposure to groundwater from beneath Site 19. No ecological risks attributable to a Navy release at Site 19 were identified.

The SJCA partnering team agreed that a removal based on the SSI samples (CH2M HILL, September 2005) collected to delineate the horizontal and vertical extent of metals and PAHs would reduce the potential human health risks to an acceptable level based on comparison to residential RBCs and background UTLs. Therefore, the SSI soil data provided the confirmation that the residual soil concentrations are protective of human health and the environment.

Table 2-1 and **Figure 2-4** show the analytical results of the sample identified as posing potentially unacceptable human health risk (SJS19-SS11) in the Metallic Slag Area and the analytical results of the samples collected to delineate the horizontal (SJS19-SS17 through SJS19-SS20) and vertical (SJS19-SB11 and SJS19-SB13) limits of removal, which reflect the concentrations remaining in place. Therefore, none of the concentrations in the soil remaining in place after the NTCRA exceeds both the dredge fill background UTLs and residential RBCs, resulting in acceptable human health risk levels and warranting NFA.

Table 2-2 and **Figure 2-5** show the analytical results of the sample identified as posing potentially unacceptable human health risk (SJS19-SB12) in the Elevated Subsurface Soil PAHs Area and the analytical results of the samples collected to delineate the horizontal (SJS19-SB14, SJS19-SB16, and SJS19-SB17) and vertical (SJS19-SB15) limits of removal, which reflect the concentrations remaining in place. With the exception of the concentration of benzo(a)anthracene at SJS19-SB16, none of the constituent concentrations in the soil remaining in place exceed both dredge fill background UTLs and residential RBCs. The concentration of benzo(a)anthracene in sample SJS19-SB16 was only slightly higher than the dredge fill background UTL and was below the maximum concentration detected in subsurface soil during the background investigation, and is therefore likely indicative of dredge fill, as discussed in Section 2.2. Therefore, the NTCRA reduced the potential human health risks to an acceptable level and NFA is warranted.

2.7 No Further Action Necessary

Based on the results of previous investigations and the NTCRA conducted, Site 19 poses no unacceptable risk to human health or the environment. The Navy, in consultation with EPA and VDEQ, agree that NFA is required for Site 19. The NFA determination for Site 19 meets the statutory requirements of CERCLA Section 121 and the requirements of the NCP for protection of human health and the environment. Because the residual soil concentrations at Site 19 do not pose a risk to human health or the environment under the most conservative exposure scenario, no restrictions on land use are necessary.

SECTION 3

References

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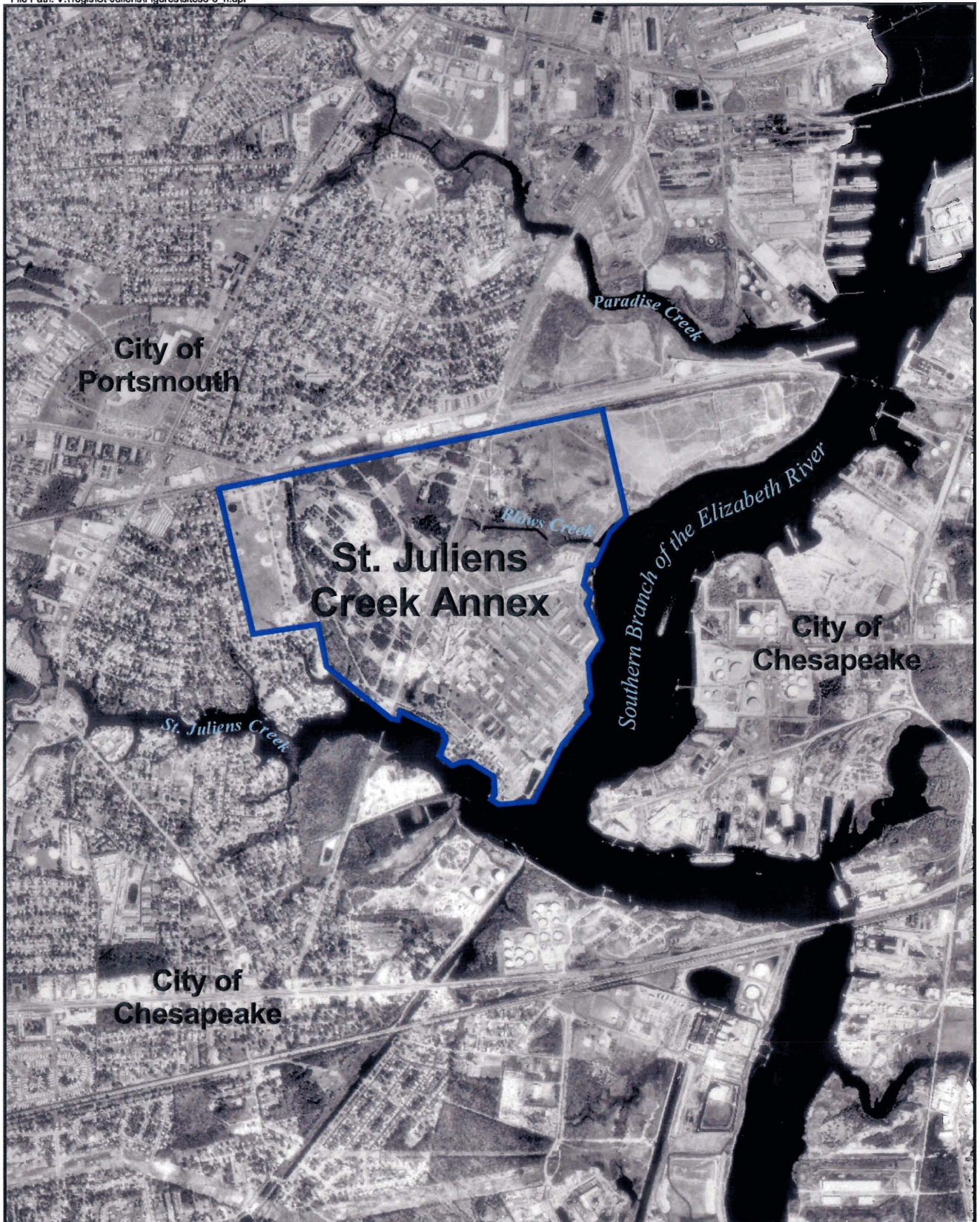
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LEGEND

 Facility Boundary



0 1000 2000 3000 Feet



Figure 2-1
Location of St. Juliens Creek Annex
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL



LEGEND

- Facility Boundary
- Site Boundary

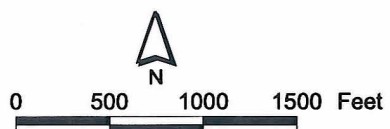
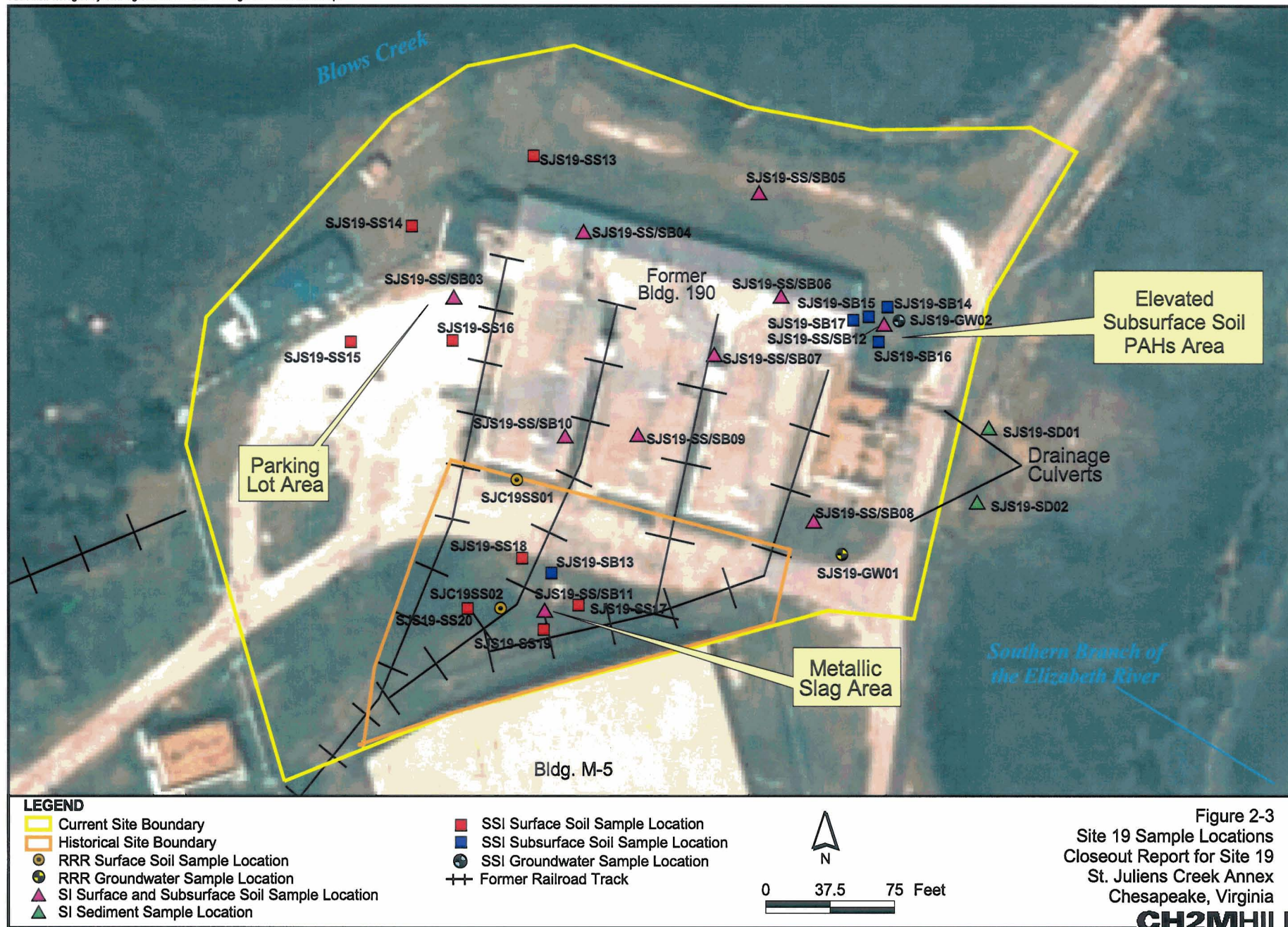
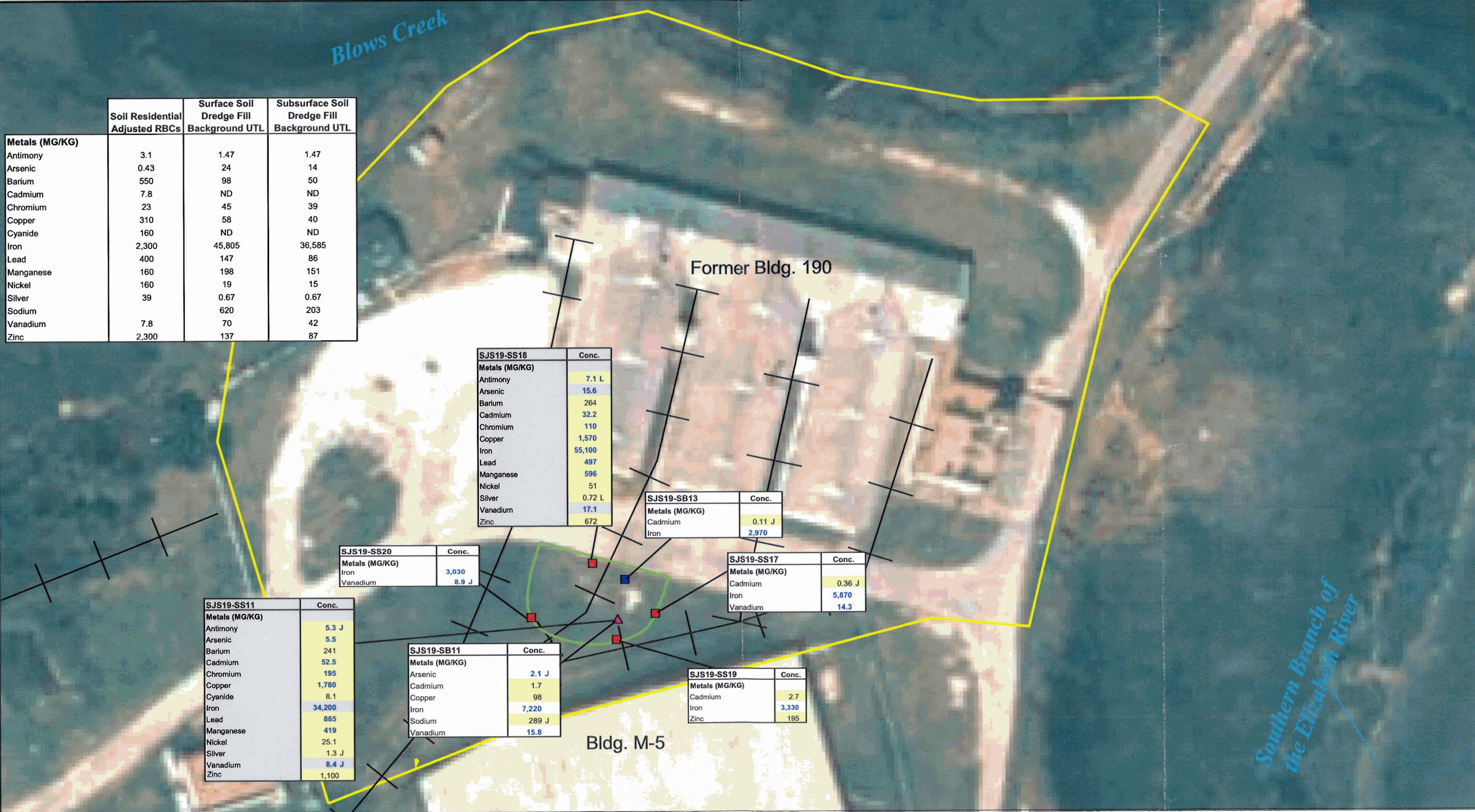


Figure 2-2
Location of Site 19
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia





LEGEND

- Site Boundary
- Extent of Metallic Slag Removal (Area = 2,866 sq.ft.)
- SI Surface and Subsurface Soil Sample Location
- SSI Surface Soil Sample Location
- SSI Subsurface Soil Sample Location
- ++ Former Railroad Track

Exceeds Background UTL
Sample removed during NTCRA
Exceeds RBC
L - reported value is biased low
J - estimated value
ND - not detected

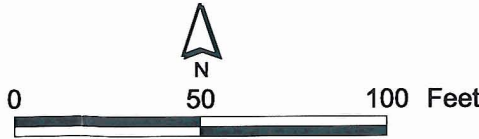


Figure 2-4
Extent of Metallic Slag Area
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia

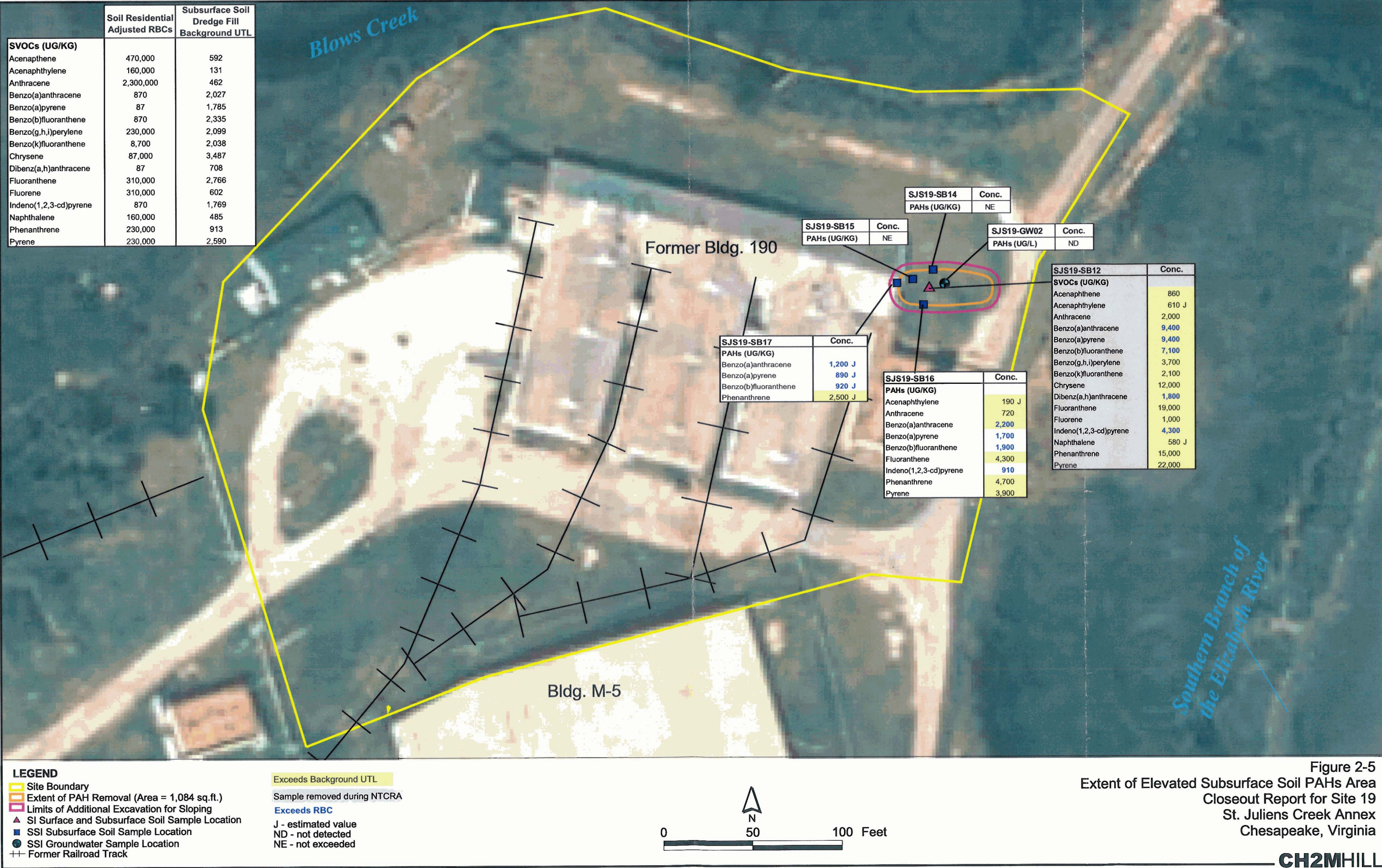


Table 2-1
Metallic Slag Area
Surface and Subsurface Soil Exceedances of Screening Criteria
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Soil Residential Adjusted RBC	Surface Soil Dredge Fill Background UTL (0-0.5 ft bgs)	Subsurface Soil Dredge Fill Background UTL (1-3 ft bgs)	SI Samples		SSI Samples				
				SJS19-SO11		SJS19-SO13	SJS19-SS17	SJS19-SS18	SJS19-SS19	SJS19-SS20
Sample ID				SJS19-SS11-00-03C	SJS19-SB11-03-03C	SJS19-SB13-04D	SJS19-SS17-00-04D	SJS19-SS18-00-04D ¹	SJS19-SS19-00-04D	SJS19-SS20-00-04D
Sample Depth				0-0.5 ft bgs	1-3 ft bgs	14-16 inches bgs	0-0.5 ft bgs	0-0.5 ft bgs	0-0.5 ft bgs	0-0.5 ft bgs
Sample Date				08/13/03	08/13/03	11/12/04	11/09/04	11/09/04	11/09/04	11/09/04
Chemical Name										
Metals (MG/KG)										
Aluminum	7,800	22,786	18,839	2,860	6,310	5,310	6,520	4,240	3,900	4,830
Antimony	3.1	1.47	1.47	5.3 J	0.63 U	0.67 UL	1 L	7.1 L	0.72 UL	0.87 UL
Arsenic	0.43	24	14	5.5	2.1 J	0.54 U	3.6 B	15.6	1.8 B	2.1 B
Barium	550	98	50	241	30.5 J	12.5 J	24.1 J	264	26.7 J	19.7 J
Beryllium	16	1	0.81	0.1 B	0.13 B	0.15 J	0.22 B	0.5 J	0.19 B	0.17 B
Boron	1,600	--	--	NA	NA	0.77 B	1.8 B	4.6	1.1 B	1 B
Cadmium	7.8	ND	ND	52.5	1.7	0.11 J	0.36 J	32.2	2.7	0.11 B
Calcium	--	3,251	3,251	1,610	503 J	320 J	225 J	1,120	302 J	155 J
Chromium	23	45	39	195	14.6	5.9	12.3	110	6.6	6.9
Cobalt	160	13	13	4.3 J	1.2 J	0.59 J	1.3 L	6.4 J	0.83 L	0.75 L
Copper	310	58	40	1,780	98	8.8	27.2	1,570	17	8.6
Cyanide	160	ND	ND	8.1	0.59 B	0.16 U	0.22 U	0.18 U	0.19 U	0.18 U
Iron	2,300	45,805	36,585	34,200	7,220	2,970	5,870	55,100	3,330	3,030
Lead	400	147	86	885	28.8	4.9 K	34.7	497	36.1	14.4
Magnesium	--	4,507	3,847	422 J	705 J	430 J	669 J	1,180	396 J	456 J
Manganese	160	198	151	419	41.4	13 L	27	596	37.3	15
Mercury	2.3	1.3	0.62	0.18	0.044 U	0.016 U	0.034 J	0.27	0.035	0.021 J
Molybdenum	39	--	--	NA	NA	0.4 B	0.86 B	9.6	0.37 B	0.35 U
Nickel	160	19	15	25.1	5.6 J	2.6 J	4 J	51	2.9 B	2.7 B
Potassium	--	4,577	3,465	306 J	577 J	204 J	452 J	877	197 J	291 J
Selenium	39	2.2	1.5	0.71 U	0.72 U	0.53 U	0.58 U	1	0.56 U	0.68 U
Silver	39	0.67	0.67	1.3 J	0.29 U	0.19 U	0.2 UL	0.72 L	0.2 UL	0.24 UL
Sodium	--	620	203	184 J	289 J	68 J	219 L	195 L	214 L	150 L
Vanadium	7.8	70	42	8.4 J	15.8	7.3	14.3	17.1	6.8 J	8.9 J
Zinc	2,300	137	87	1,100	62.3	21.6	52.8	672	195	22.3

Notes:

COPCs identified in HHRS conducted during the SI (CH2M HILL, June 2004)

Exceeds Background UTL

Exceeds RBC

¹ A duplicate was collected for this sample and the results provided are the maximum concentration between the sample and the duplicate.

-- No criteria available

NA - Not analyzed

ND - Not detected

B - Blank contamination

J - Reported value is estimated

L - Reported value is biased low

U - Not detected

Table 2-2
Elevated Subsurface Soil PAHs Area
Subsurface Soil Exceedances of Screening Criteria
Closeout Report for Site 19
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Soil Residential Adjusted RBC	Subsurface Soil Dredge Fill Background UTL (1-3 ft bgs)	SI Sample	SSI Samples				
			SJS19-SO12	SJS19-SO14	SJS19-SO15	SJS19-SO16	SJS19-SO17	
Sample ID			SJS19-SB12-03-03C ¹	SJS19-SB14-03-05B	SJS19-SB15-06-05B	SJS19-SB16-03-05B	SJS19-SB17-03-05B	
Sample Depth			1-3 ft bgs	1-3 ft bgs	4-6 ft bgs	1-3 ft bgs	1-3 ft bgs	
Sample Date			08/13/03	04/20/05	04/20/05	04/20/05	04/20/05	
Chemical Name								
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	390,000	--	72 J	370 U	380 U	81 J	42 J	
2-Methylnaphthalene	31,000	--	320 J	370 U	380 U	190 J	150 J	
Acenaphthene	470,000	592	860	370 U	380 U	320 J	230 J	
Acenaphthylene	160,000	131	610 J	370 U	380 U	190 J	390 U	
Acetophenone	780,000	--	760 U	370 U	380 U	400 U	390 U	
Anthracene	2,300,000	462	2,000	370 U	380 U	720	390 J	
Benzaldehyde	780,000	--	79 J	370 UJ	380 UJ	400 UJ	390 UJ	
Benzo(a)anthracene	870	2,027	9,400	370 U	380 U	2,200	1,200 J	
Benzo(a)pyrene	87	1,785	9,400	370 U	380 U	1,700	890 J	
Benzo(b)fluoranthene	870	2,335	7,100	370 U	380 U	1,900	920 J	
Benzo(g,h,i)perylene	230,000	2,099	3,700	370 U	380 U	1,100	540 J	
Benzo(k)fluoranthene	8,700	2,038	2,100	370 U	380 U	880	310 J	
Carbazole	32,000	--	660 J	370 U	380 U	320 J	120 J	
Chrysene	87,000	3,487	12,000	370 U	380 U	2,200	1,100 J	
Di-n-octylphthalate	310,000	--	760 U	370 U	380 U	400 U	390 U	
Dibenz(a,h)anthracene	87	708	1,800	370 U	380 U	400 U	390 U	
Dibenzofuran	16,000	--	420 J	370 U	380 U	450	170 J	
Fluoranthene	310,000	2,766	19,000	370 U	380 U	4,300	1,800 J	
Fluorene	310,000	602	1,000	370 U	380 U	600	360 J	
Indeno(1,2,3-cd)pyrene	870	1,769	4,300	370 U	380 U	910	380 J	
Naphthalene	160,000	485	580 J	370 U	380 U	320 J	410 J	
Phenanthrene	230,000	913	15,000	370 U	380 U	4,700	2,500 J	
Pyrene	230,000	2,590	22,000	370 U	380 U	3,900	2,200 J	
n-Nitrosodiphenylamine	130,000	--	130 J	370 U	380 U	400 U	390 U	

Notes:

COPCs identified in HHRS conducted during the SI (CH2M HILL, June 2004)

Exceeds Background UTL

Exceeds RBC

¹ A duplicate was collected for this sample and the results provided are the maximum concentration between the sample and the duplicate.

-- No criteria available

NA - Not analyzed

ND - Not detected

J - Reported value is estimated

U - Not detected